



TRANSPORTATION ENGINEERING

CIV ENG 490
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF WISCONSIN --
MILWAUKEE
FALL 2016

JIE YU, Ph.D.
Assistant Professor





Course Syllabus

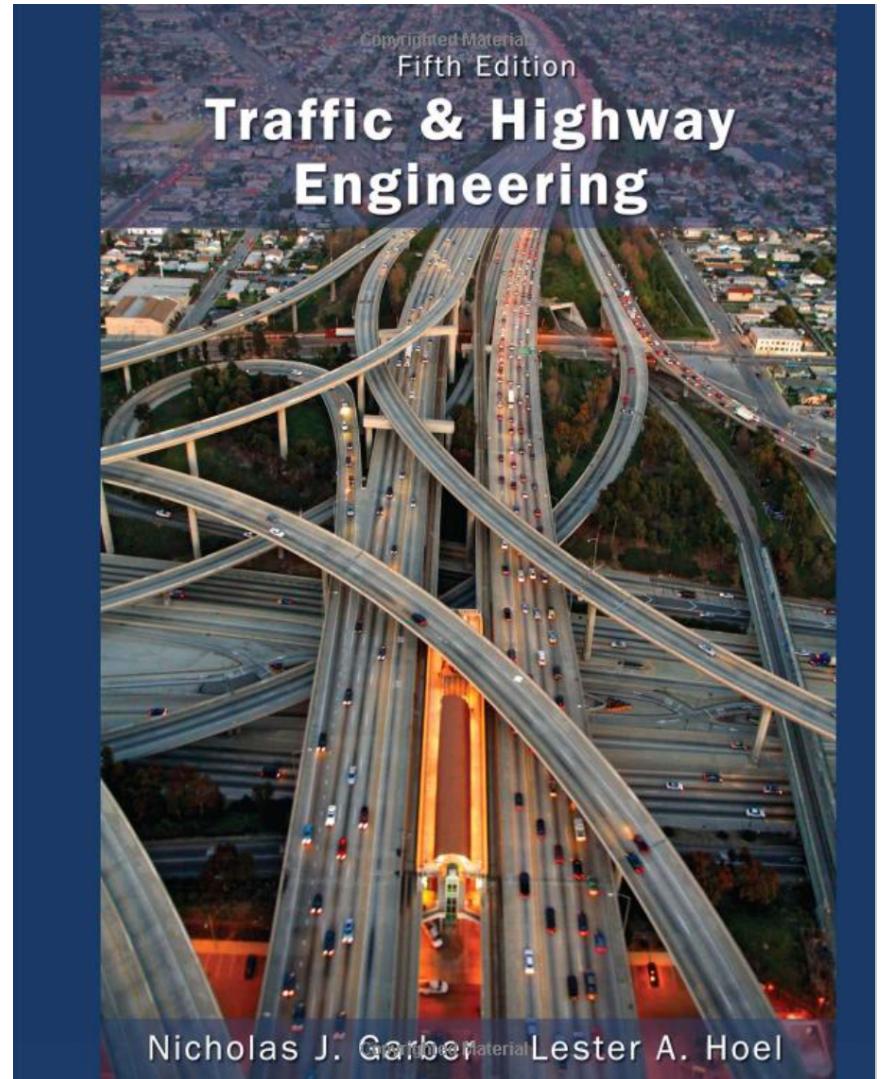
- Class Schedule: MW 11:00AM – 12:15PM
EMS E159
- Instructor: Dr. Jie Yu (yu22@uwm.edu)
- Office: NWQ 4428
- Office Hours: M 01:30 -02:30PM or by appointment



Course Syllabus

- Textbook

Traffic and Highway
Engineering, 5th Edition,
CL Engineering, 2014





Course Syllabus

- Prerequisite

1. Civ Eng 280; Junior students with an Engineering Major.
2. The specific background topics that will be applied in this class comprise college mathematics and physics including calculus, linear algebra, and probability theories.
3. Familiarity with computer spreadsheets and the use of common computer applications (a word processor, a browser) is assumed.



Course Syllabus

- Homework

1. Due at the beginning of the class in each week following the assignment
2. A 20% penalization is applied for late homework
3. Late homework will not be accepted once the graded homework set has been returned to the rest of the class
4. Electronic submissions are OK via D2L, but HARD COPIES are preferred
5. Your two lowest homework grades will be dropped
6. Graduate students must do all extra credit problems for normal credit.



Course Syllabus

- Grading Policy

Homework	20%
▫ Which should be done by yourself and turned in at the specified time. Homework solutions would be emailed to you after grading.	
Mid-term (2)	30%/15%/0%
Final	40%/55%/70%
Class Participation/Communications	10%
Total	100%

Exams are open-book.

You are not required to take the mid-term exams.



Poll – How many of you are concentrating in:

Transportation Engineering	
Environmental Engineering	
Structural Engineering	
Water Resources Engineering	
Geo-technical Engineering	
Mechanics	
Undecided (Civil)	
Other	



01 INTRO/CONCEPT



What is Transportation?





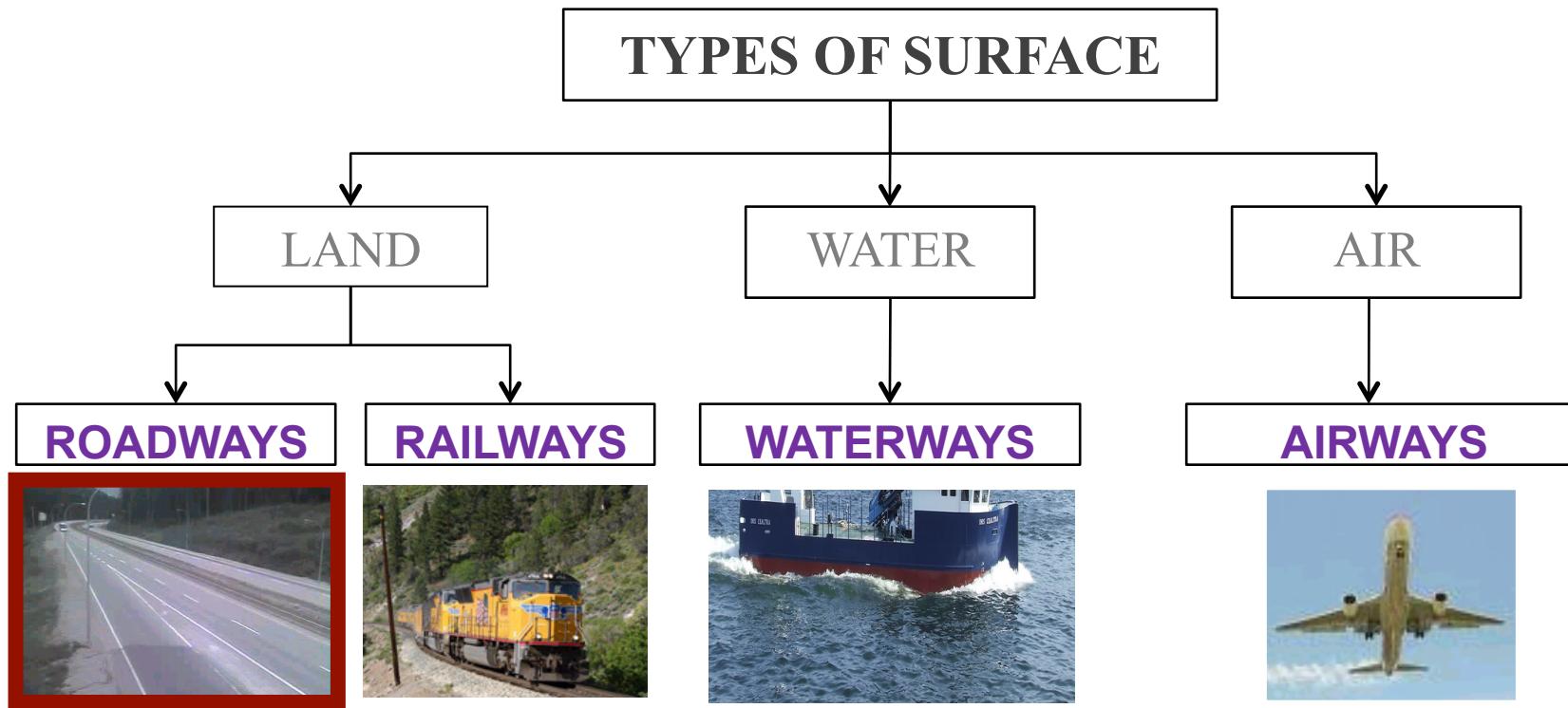
What is Transportation Engineering?

transport/transportation (*n.*) - The movement of people and goods from one location to another

“the branch of engineering which applies technology, science, and human factors to the planning, design, operations and management for any modes of transportation”.

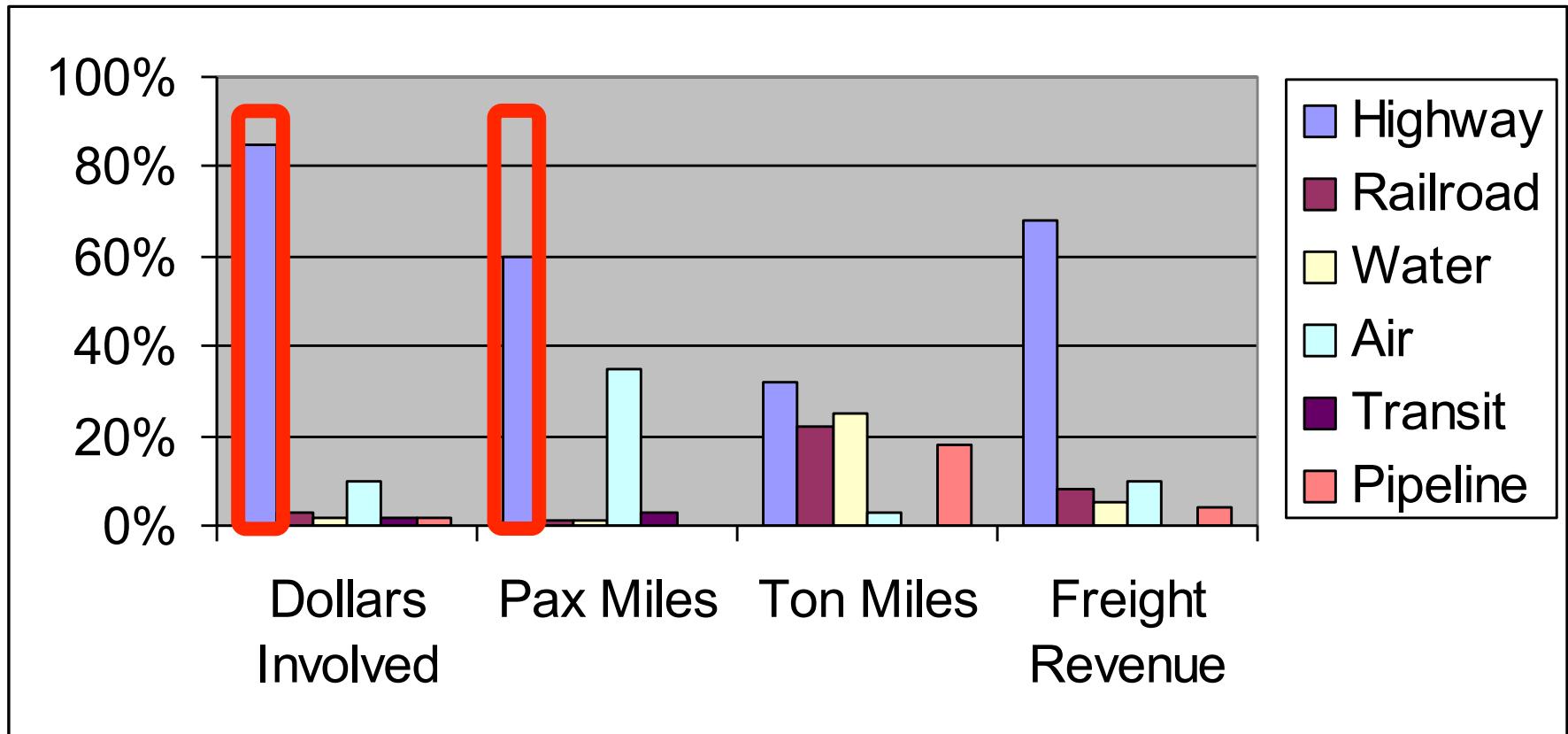


Modal Classifications, Surface





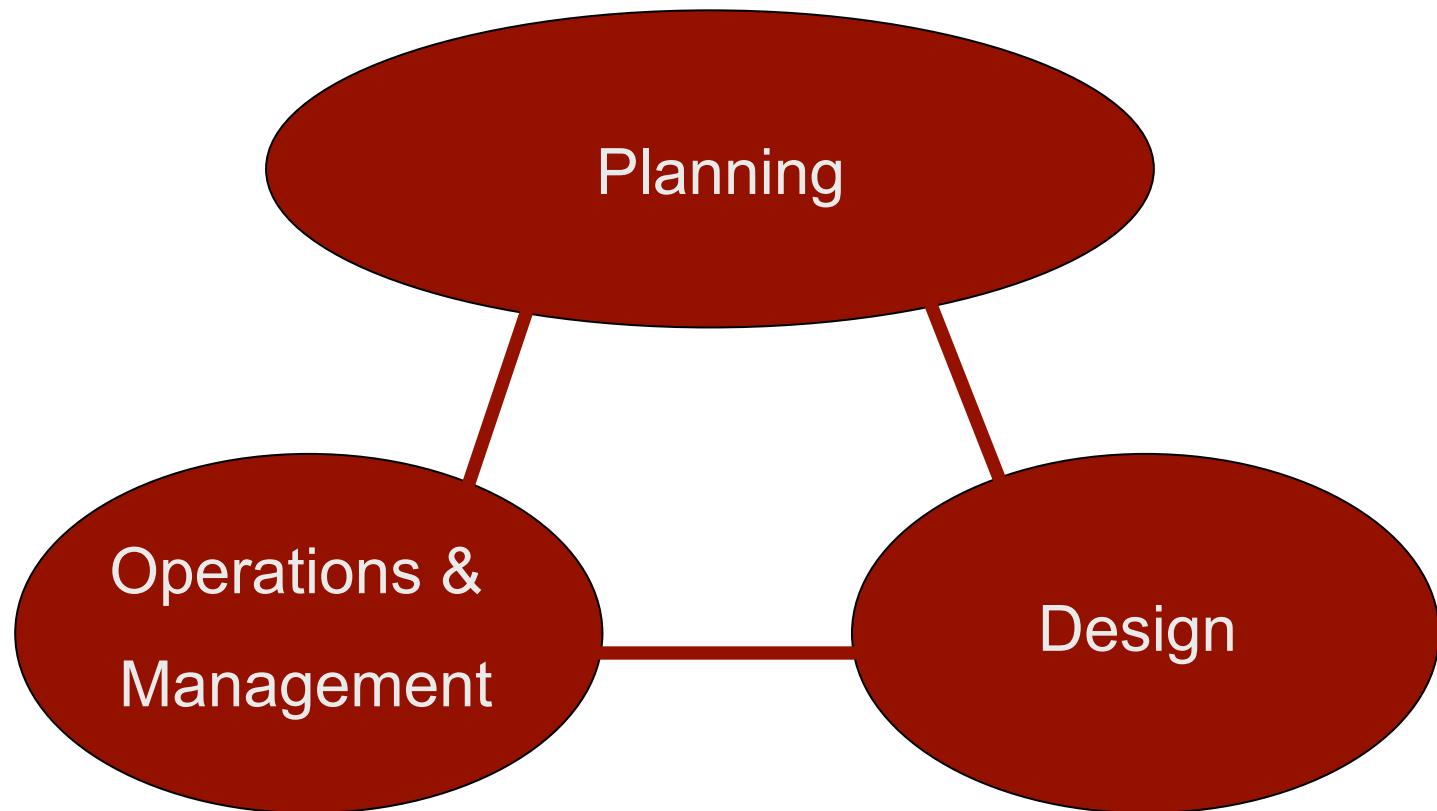
Modal Activity



National-level Transport Modal Activity



Emphasis of Areas (Course Overview)



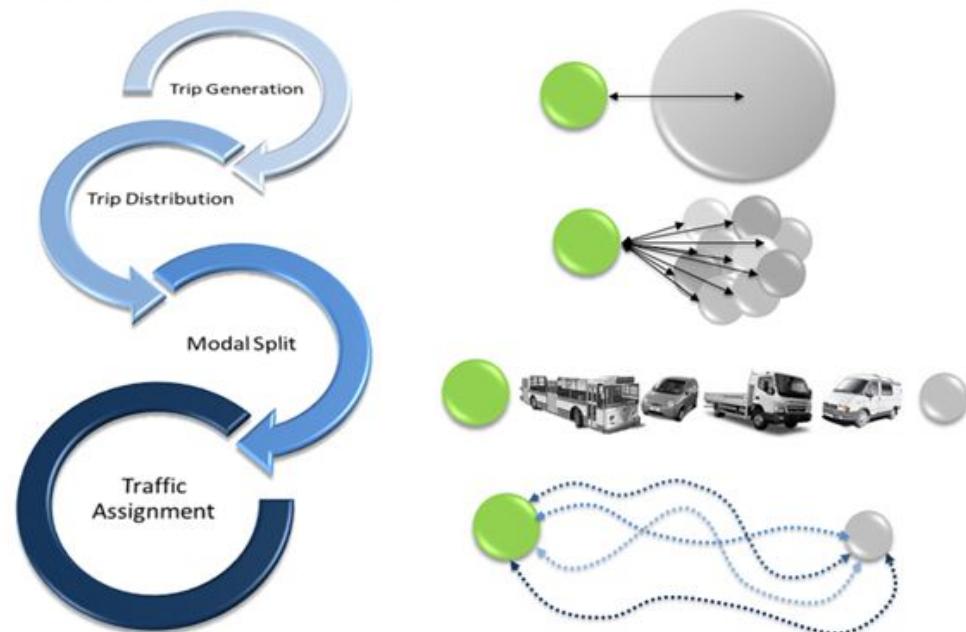


Planning

Transportation planning aims to **predict the needs/demands** for a particular service. Several alternatives are analyzed to determine how well each can satisfy the needs/demands

4-step Travel Demand Forecasting

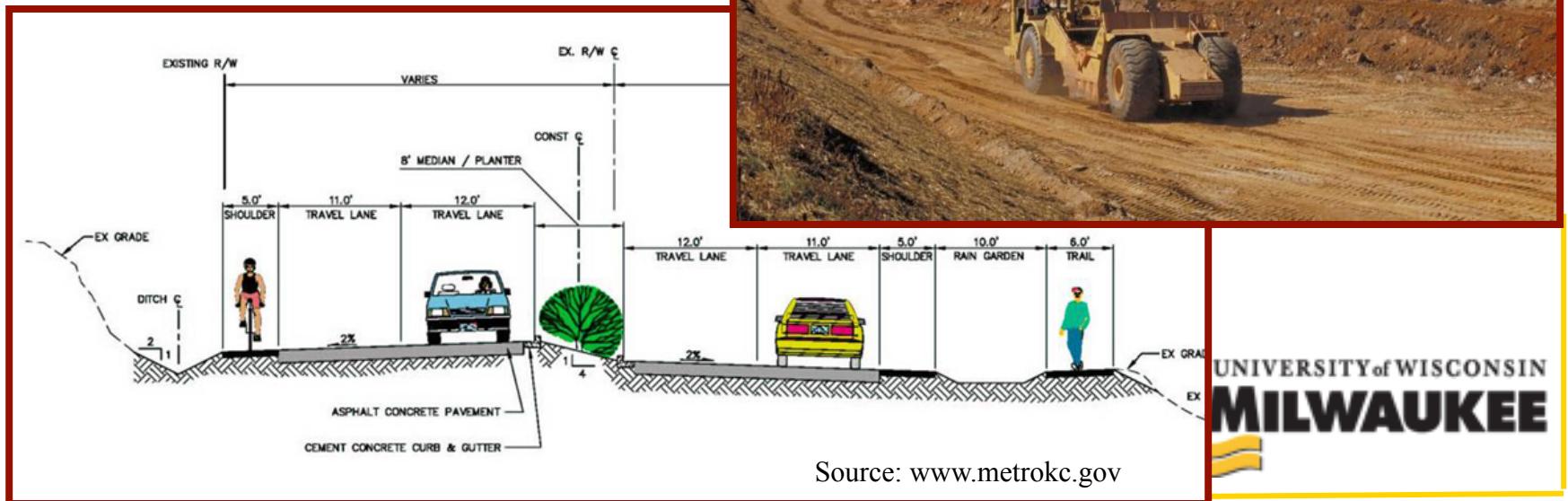
- Trip Generation – **Should I make trip?**
- Trip Distribution – **Where will be my destination?**
- Mode Choice – **Do I bike, walk, drive or take bus?**
- Network Assignment – **Which route should I take?**



Design (for safety & efficiency)

Highway geometric design for safety

- Horizontal
- Vertical
- Cross-Sectional



Highway Design for efficiency



Performance Measures

- Delay
- Level of Service
- # of Stops
- Queue Length



What DESIGN is not...Hopefully





Operations & Management

Traffic O&M aim to improve the safety and efficiency on the existing highway system by monitoring real-time traffic info and using various traffic management tools to reduce incidents and relieve traffic congestion.

WisDOT State Traffic Operations Center (STOC) uses various traffic management tools, such as: closed circuit television units, ramp meters, variable message signs (VMS), highway advisory radio (HAR), roadway sensors and other tools.

Source: WISCONSIN.GOV





Transportation Fun Facts

- 16% of U.S. GDP
- \$1.5 trillion on expenditures
- 70% of petroleum in U.S.
- U.S. citizens travel on average
 - 1 hour per day
 - 12,000 miles per year



The Not So Fun Facts

TRAFFIC JAM



TRAFFIC CRASH





The Not So Fun Facts

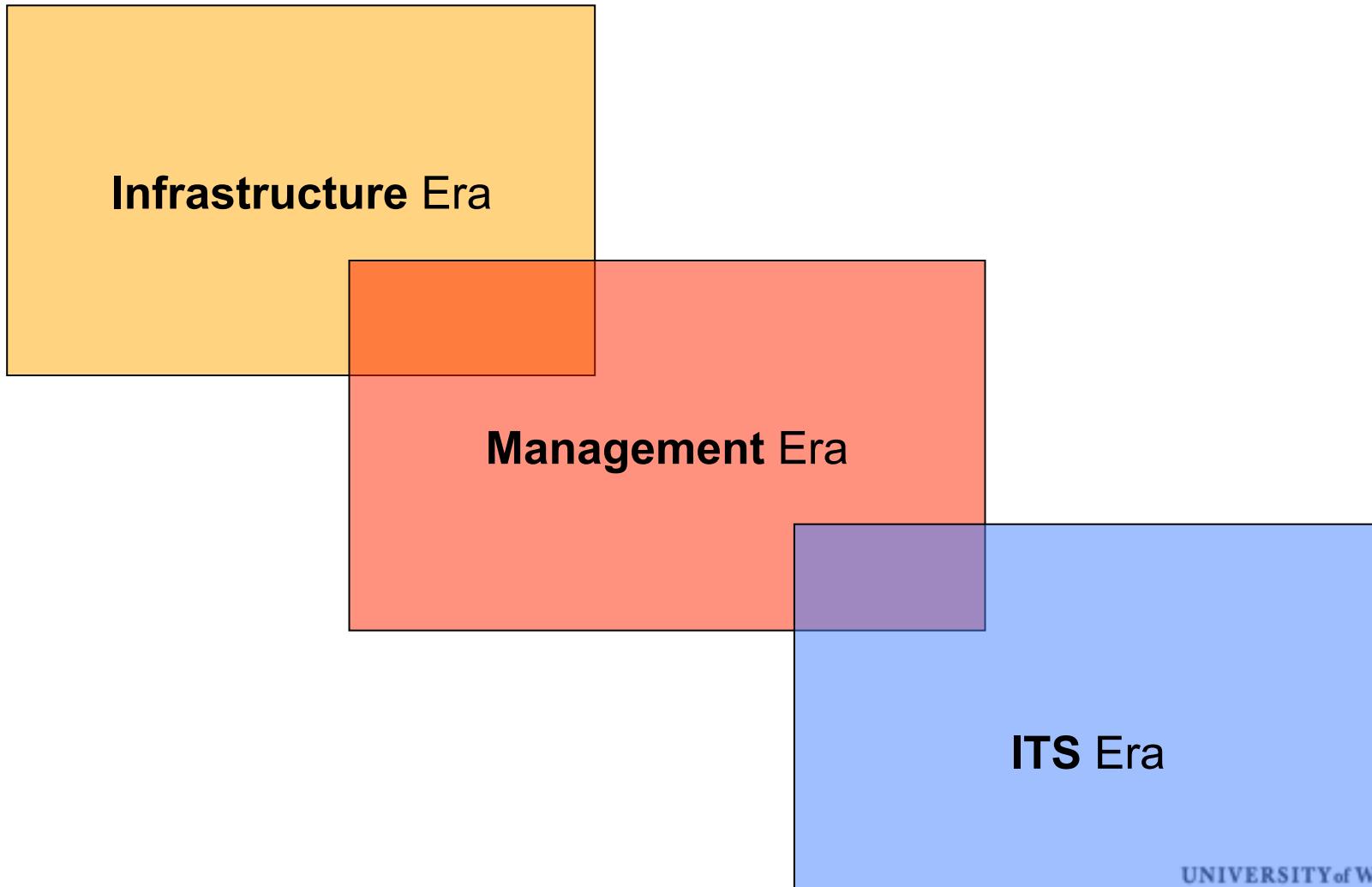
- We are still building roads. **Highways miles** per person in 76 metropolitan areas showed an increase of **10%** in 1984-2000.
- Delay is growing much faster than population. In 1982-1997, pop grew 22%, but **delay** grew **278%**
- **1.24 million** people **die** each year as a result of road traffic crashes
- The transportation sector accounts for **22%** of global **energy use** and **27%** of global **carbon emissions**.



Solutions?



Solution Eras



ITS Era

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- Focus on **building new** physical facilities
- Build what “they” want
- Focus on mobility

Milwaukee: Marquette Interchange (I94/43/794)

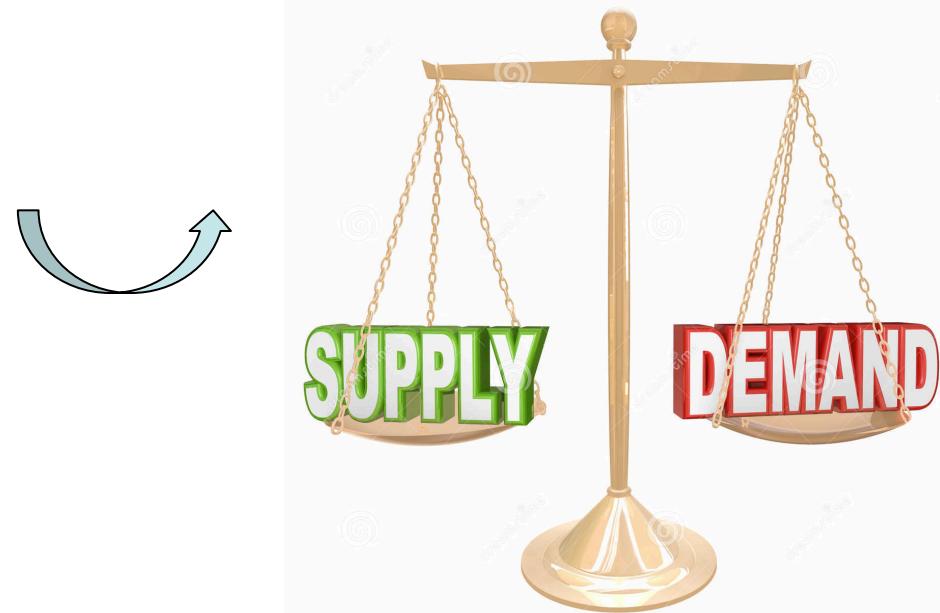
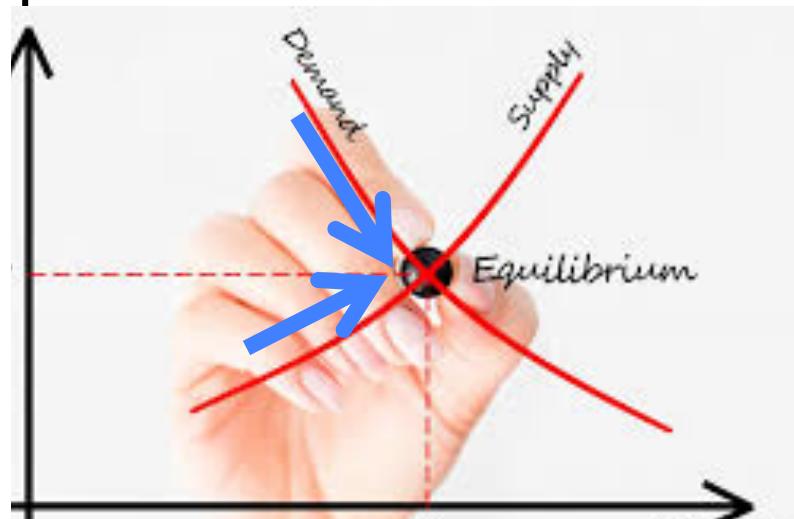
Rebuilding and expanding Milwaukee’s Marquette Interchange, cost \$810 million to complete in 2008. It took 2.25 million man hours to construct the 28 ramps and 21 miles of roadway. The concrete and steel needed to complete the project weighed 60,000 tons.

Federal Highway Administration gave the project its “Award of Excellence in Highway Design.” Wisconsin is currently preparing for an even bigger interchange project: the \$1.7 billion “Zoo Interchange,” not far away.

Source: STREETSBLOG USA



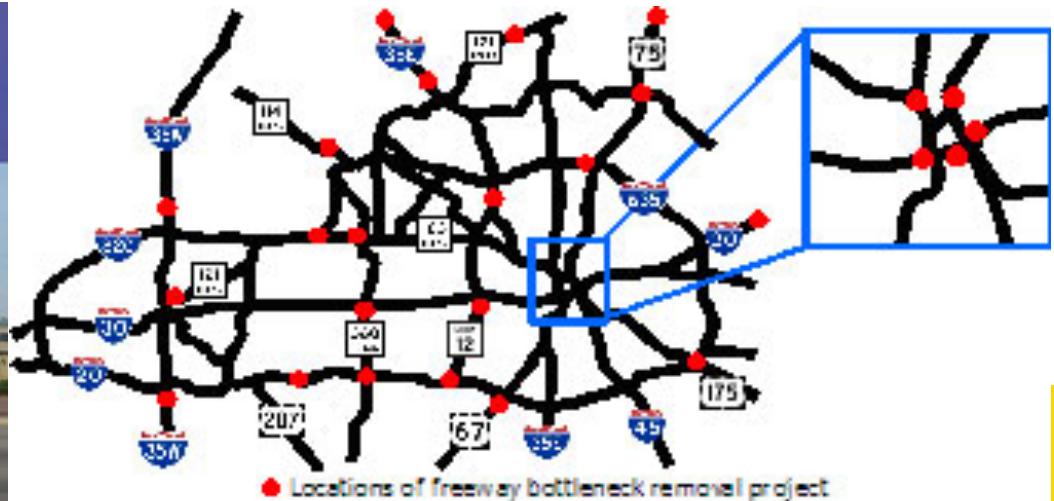
- Manage the existing transportation system
 - TSM: Transportation System Management
 - TDM: Transportation Demand Management





Transportation Systems Management

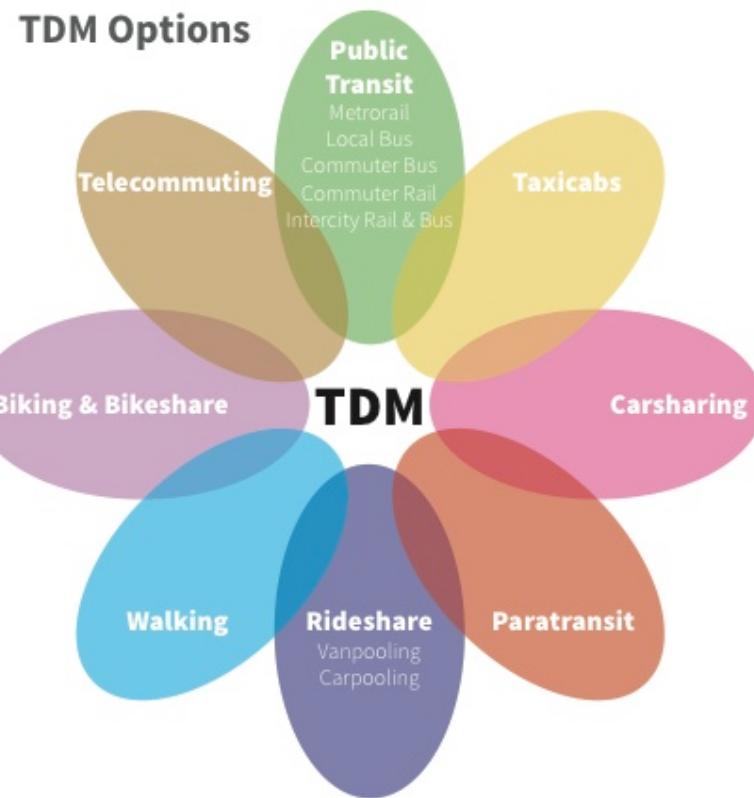
- The Transportation Systems Management (TSM) approach to congestion mitigation seeks to identify improvements **to enhance the capacity of existing system** of an operational nature.





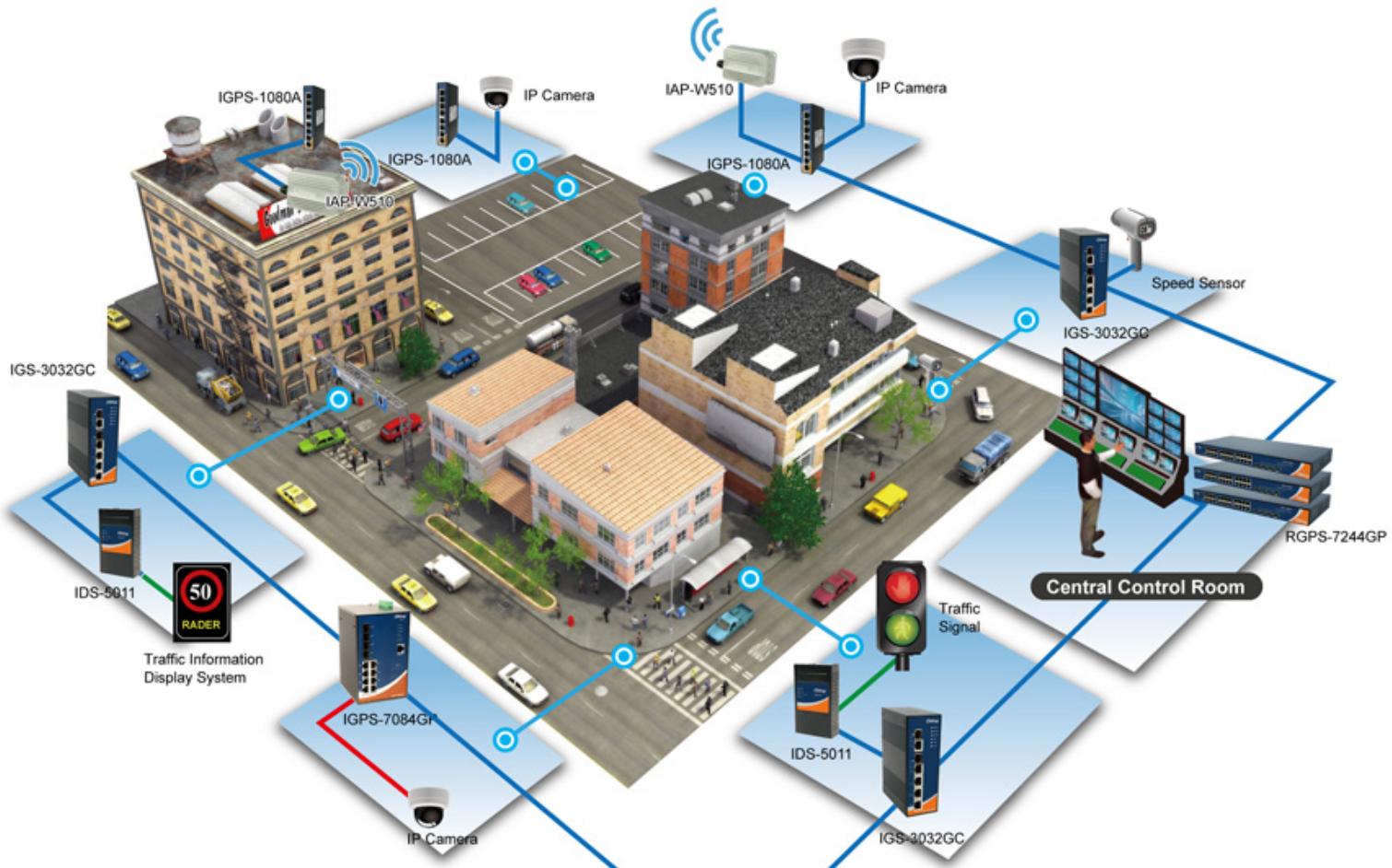
Transportation Demand Management (TDM)

- **Transportation demand management** is the application of strategies and policies to **reduce travel demand** or to **redistribute this demand** in space or in time.



Intelligent Transportation System

Int
for
info
or c



Optic Fiber CAT5e
PoE Link Serial

CONSIN

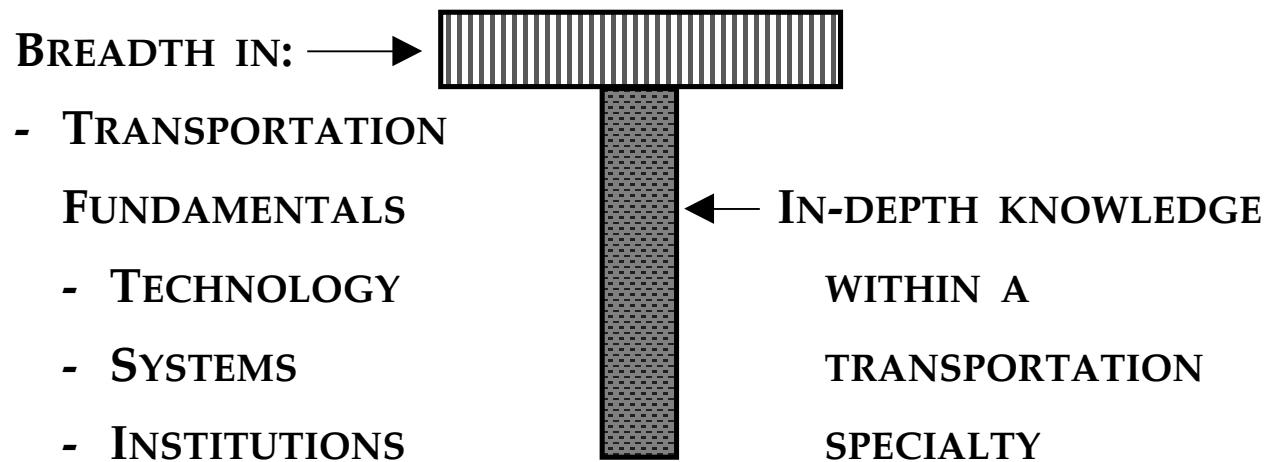
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The Needs of Becoming Transportation Professionals



THE “T-SHAPED” NEW TRANSPORTATION PROFESSIONAL





Career links

- TRB Transportation Careers
 - <http://www.trb.org/Main/Careers.aspx>
- ITE Career Center
 - <http://jobs.ite.org>
- ASCE Career Connections
 - <http://careers.asce.org/jobseekers/>



Upcoming Events

- Scholarships - Wisconsin Asphalt Pavement Association

<http://www.wispave.org/2016-wapa-scholarships>

- ITS Wisconsin Forum
Sept 28, 2016

